

# Catalytic Reforming for Fuel Cells Using Metal Foam Substrates

**Dr. Phillip Hutton, Technical Director**

**Dr. Pavel Snytnikov, Technical Director**



**NOVOROCS Technologies LLC**



# Novorocs Technologies

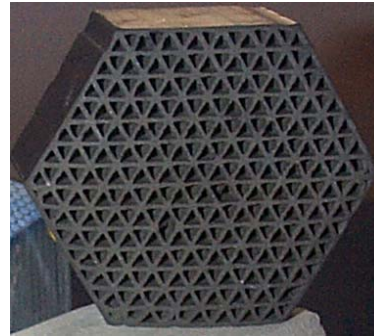
- Founded 2013
  - Joint Venture between Solid Cell & Unicat
  - Catalyst Development & Fabrication
  - Reactor Engineering & Manufacturing
  - System Design & Testing



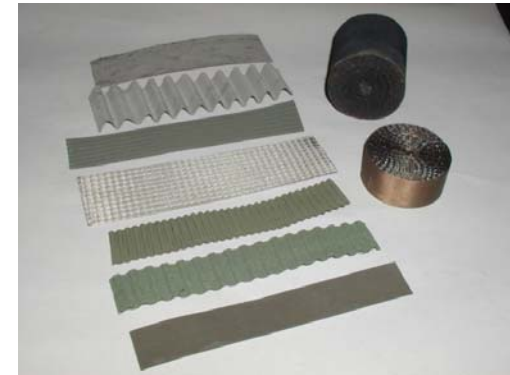
# Catalytic Modules and Reactors for Syngas Production



**Reforming Test Sets**



**Ceramic Catalyst**



**Foil, Solid and Porous Wafer Catalyst**



**Metal Foam Catalyst**



**Pilot Scale Systems**

# What is a Metallic Foam

- Metallic foams are highly porous structures with an interconnecting lattice, consisting of complex interconnected porosity, where the size and shape of the pores are not well defined.



# Mechanical Properties

- **High Strength and Stiffness** - Allows the foam substrate to maintain shape and structure at high temperatures
- **Limited Plastic Deformation** - Allows the foam to be fitted into tight spaces for close tolerances
- **High Specific Surface Area** - Increases catalytic surface area for reactions





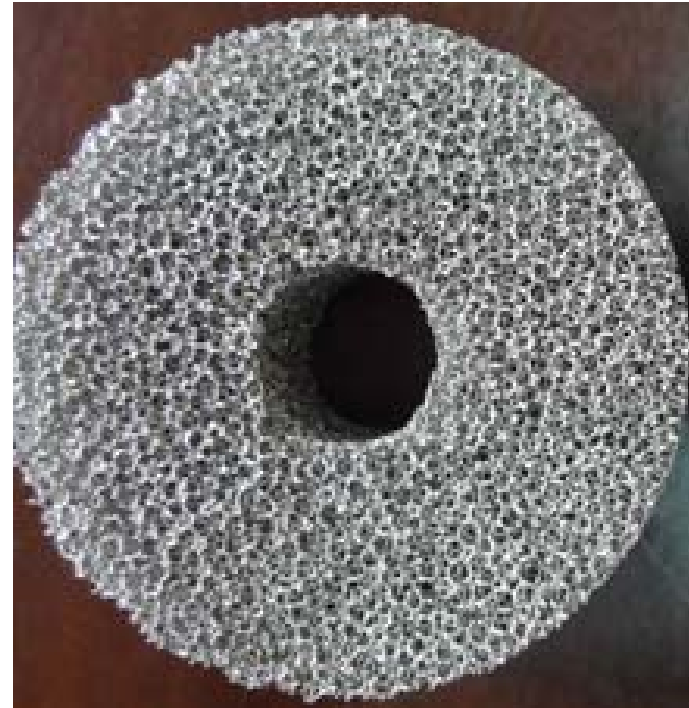
# Thermal Properties

- **High Thermal Conductivity** - Has greater ability to transport heat to and away from reaction area
- **Thermal Shock Tolerance** - Maintains shape after repeated thermal cycles. Can be heated and cooled very quickly
- **Thermal Expansion** - Can match thermal expansion with vessel and catalyst material to maintain tight tolerances throughout the operating temperature range

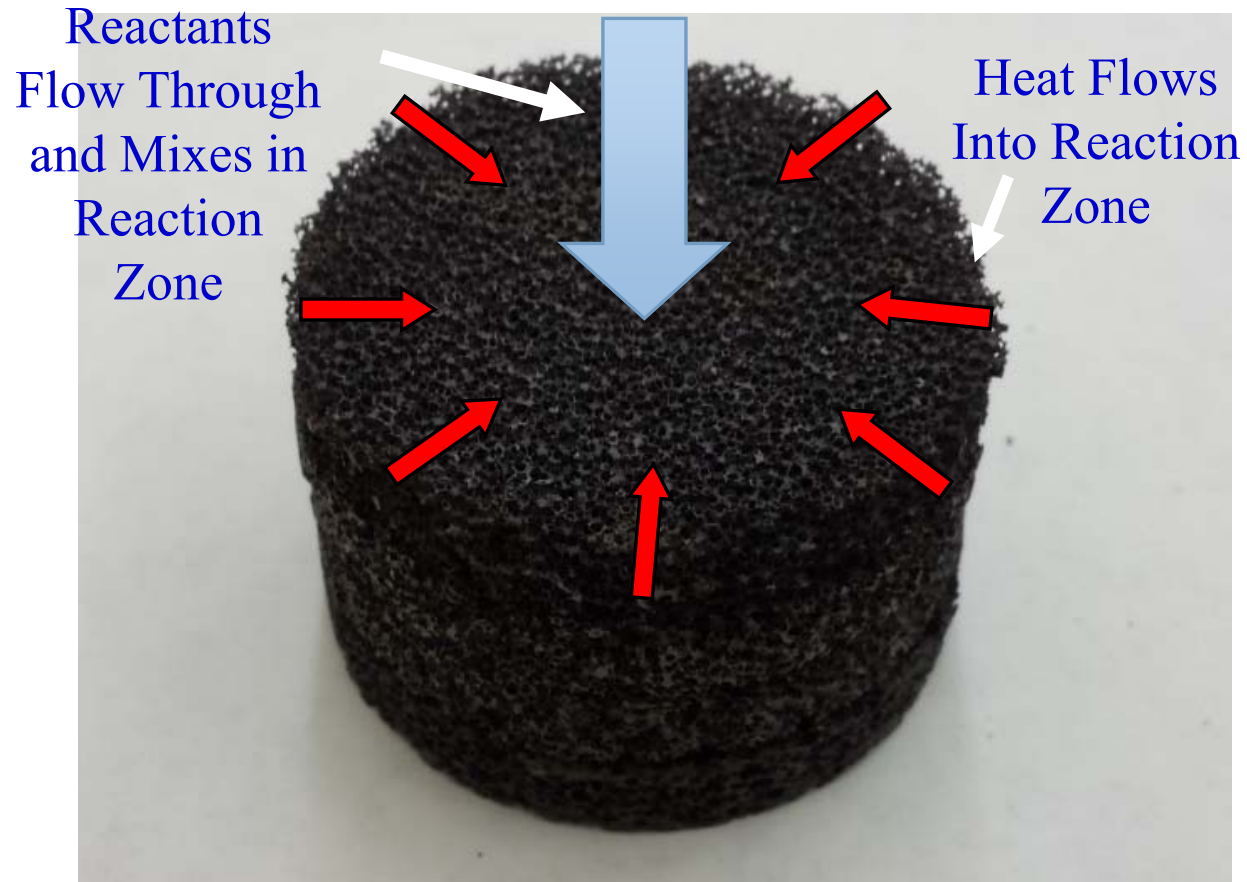


# Flow & Reaction Characteristics

- **High Tortuosity** - Promotes mixing and diffusion of reactants to the active catalytic area. Produces turbulent flow as opposed to laminar flow. Reduces hot spots
- **Variable Pore Size** - Allows trade-off between specific surface area and pressure drop

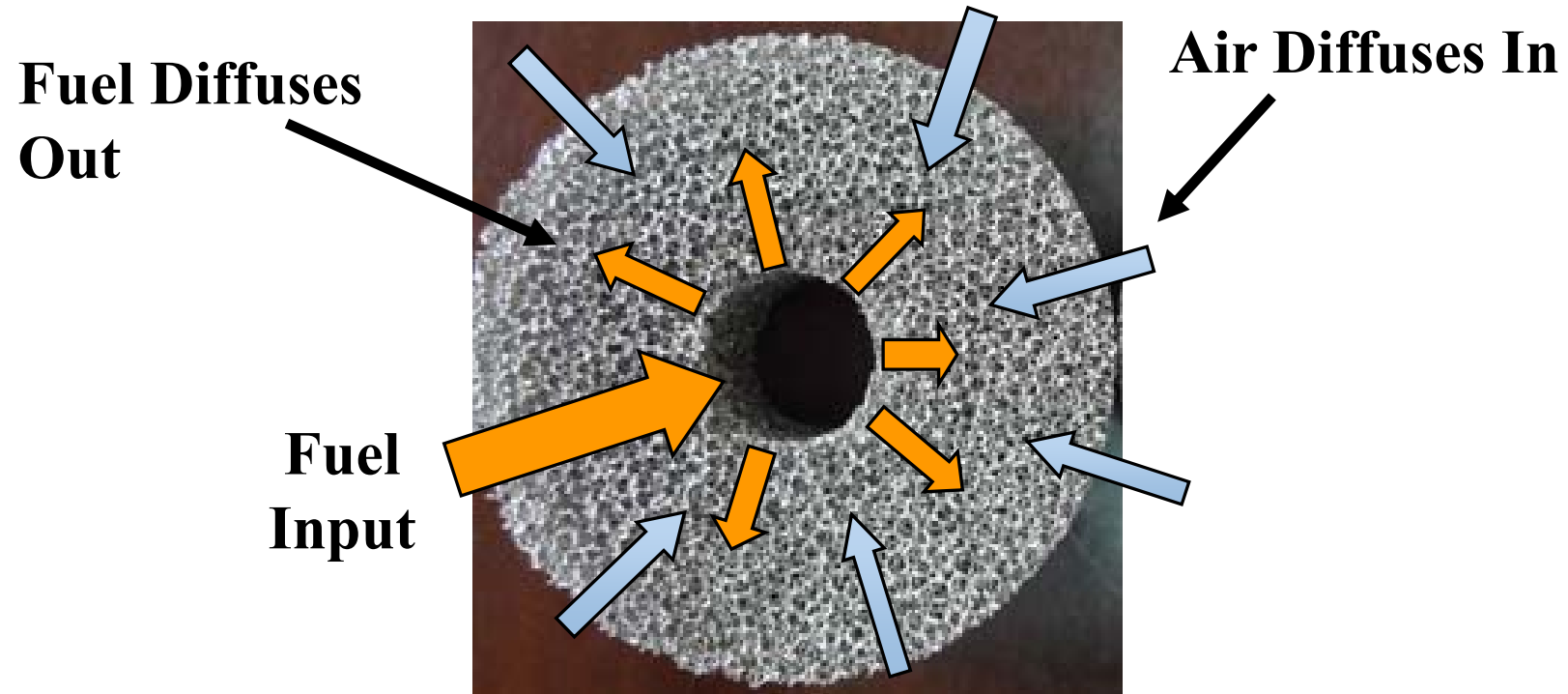


# Catalytic Reforming





# Catalytic Combuster





**Thank you!**  
**Please visit us at booth D37**

